## REMARKS

Claims 1, 3, 5, 7-9, 11, 24, 28, 32, 34-43 and 45-53 are pending. No claims are amended. A Request for Continued Examination (RCE) is being filed in order to consider a Declaration submitted with this amendment.

Rejections Under 35 U.S.C. §103(a)

All of the claims have been rejected as obvious. Two references common to all of the rejections are Haswell et al., Lab on a Chip (2001), pp. 164-166 in view of Tonkovich et al. (US Patent No. 6,488,838).

Haswell et al. describe an experiment in which a thin tube was packed with catalyst beads. See page 165 under the heading "Flow experiments." Haswell et al. made the catalyst beads by immobilizing a nickel complex onto resin beads. Haswell et al. reported reaction rates for the Kumada-Corriu reaction compared between the packed microchannel tube and a batch reactor. Haswell et al. reported that the reaction proceeded much faster in the microchannel as compared with the batch reaction. At the bottom of the second column of page 165, Haswell et al. teach away from a bulk flow path: "In the constraints of the microreactor, where the beads are packed in the capillary, the reactive solution is driven through the pores under pressure and the number of catalytic sites available for reaction is increased."

The Tonkovich reference is cited to show that a conventional way to accomplish heat transfer in a microchannel reactor is to arrange a heat transfer microchannel adjacent to the reaction channel.

The claims recite that the microchannel comprises a bulk flow path. Pages 17-19 of Applicants' specification describe an example of the inventive system for conducting the Knoevenagel reaction. On page 19, Applicants show that the use of a tethered catalyst in a microchannel having a bulk flow path produced superior results as compared to the same reaction in a packed microchannel. As stated on page 19, "These results demonstrate the significantly higher yields at much shorter residence times when this type of catalyst is tethered to the walls of a microchannel reactor compared to conventional packed bed or packed microreactors." Thus, applicants have established surprising and superior results as compared to the prior art (i.e., as compared to a packed microreactor as in the Haswell reference). In view of these unexpected results, applicants have established nonobviousness of the claimed invention.

Attached to this Response is a Declaration by Dr. Brophy that shows a comparison of a tethered catalyst on a channel wall adjacent a bulk flow path (the claimed invention) versus a tethered catalyst on beads packed in a microchannel. For the inventive configuration, the catalyst turnover rate (TOR) was an order of magnitude higher than the packed bed configuration (see paragraphs 2-5 of the attached Declaration).

Both applicants and Haswell et al. used the Knoevenagel reaction to model the general case of using tethered catalysts in microchannel reactors. Both groups expected results from the Knoevenagel reaction to be generally applicable and there is no reason to believe that the Knoevenagel reaction is a special case. Thus, the showing of unexpected results is commensurate in scope with the claimed invention.

Two ways to show that an invention is not obvious are "(1) [t]hat the prior art taught away from the claimed invention...or (2) that there are new and unexpected results relative to the prior art.'" quoting *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004). In this case, there is ample evidence of both a teaching away in the prior art, and of unexpected results. As noted above, in the cited Haswell reference, Haswell et al. teach that it is necessary to operate with high pressure to force solution through packed beads to obtain improved performance. In other words, Haswell et al. teach away from a reactor employing a bulk flow path. Contrary to Haswell's teaching that a packed microchannel is necessary for improved results, applicant's discovered that superior results are obtained with a bulk flow path. There is no basis in the prior art to expect that tethered catalysts would have better catalyst turnover rates in a flow-by configuration as compared to flow through. Thus, applicants have established superior and unexpected results. See MPEP 716.02(a) Therefore, withdrawal of the section 103 is respectfully requested.

Claim 28 has been rejected as being obvious over Haswell in view of Tonkovich and further in view of Hoveyda et al. This rejection is respectfully traversed.

Claim 28 recites that the microchannel comprises a chiral auxiliary. Hoveyda et al. in US 2004/00192112 describes chiral catalysts but does not describe chiral auxiliaries. Chiral auxiliaries are not chiral catalysts. Chiral auxiliaries have been long known, and are defined in, for example, http://en.wikipedia.org/wiki/Chiral_auxiliary. It may be further observed that the use of chiral auxiliaries was described in applicants' priority provisional application (which is

available for viewing through the PAIR system) and thus, the Hoveyda reference does not qualify as prior art.

Dependent claims 32, 40, 41, 43, 45, 46, and 48 have been rejected over Haswell in view of Tonkovich and further in view of Kang, Hoveyda, Chapman, or Ostoja-Starzewski. These dependent claims are non-obvious for the same reasons as the independent claims from which they depend.

Conclusion

If the Examiner has any questions or would like to speak to Applicants' representative, the Examiner is encouraged to call Applicants' attorney at the number provided below.

Respectfully submitted,

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